# Texas Entry–Year Agriculture Teachers' Perceptions, Practices, and Preparation Regarding Safety and Health in Agricultural Education

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## Abstract

The purpose of this study was to gather benchmark data for the assessment of the knowledge, attitudes, and perceptions regarding agricultural safety issues and curricula held by Texas agricultural teachers with less than two full years of teaching experience (entry–year teachers). Seventy–four of 118 well–distributed teachers responded to this survey. Researchers concluded that more females were entering a traditionally male–dominated field. Overall, teachers addressed safety within units of instruction rather than as separate units. The most useful forms of new teaching resources that this group of teachers would like to see produced were safety videos and study guides, and class demonstration/simulation activities. There was a significant difference in rankings between teachers less than 26 years old and teachers more than 26 years old regarding the usefulness of transparencies as a new teaching resource ($F = 5.00$, $p = 0.0268$). Few teachers were currently CPR and first aid certified, even though most had received training and completed a general safety and/or health related course while in college. Teachers generally agreed philosophically with most practices and exhibited personal beliefs consistent with proper safety preparedness and practice in agricultural settings. However, many of these teachers failed to practice what was expected of safe tractor operators, such as wearing safety belts and allowing younger drivers to operate the equipment.

*Keywords.* **School shop safety, Agricultural mechanics laboratory safety, Agricultural teacher safety instruction.**

Concern for the health and safety of students in our nation's public schools has recently grown in importance. Unfortunately, this attention has grown out of increasing instances of premeditated violent acts. One outcome of these trage-

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dies has been revision of school safety policies by administrators. This in turn has created a sense of urgency to improve general student safety. However, non–violent, unintentional injuries and personnel safety training may be overlooked in these revised policies. This is important because unintentional injuries have become the greatest risk to the health of children and adolescents (DHHS, 1990).

The agricultural industry is inherently dangerous and prone to worker injury and death. In 1995, the National Safety Council reported 140,000 disabling farm–related injuries and a rate of 24 deaths per 100,000 agricultural workers (NSC, 1996). This situation presents a special challenge for agricultural education programs. Considering that teachers and administrators stand to a limited degree *in loco parentis* to the students under their supervision, it is a necessity for agriculture teachers to model their safe practices and behaviors and to create a positive safety climate. These actions are important for reducing preventable injuries, not only while the students are in school but also when they enter the workforce.

School administrators must continue to offer encouragement to students and teachers, while diligently developing a positive school safety climate. Ullrich (1997) recommended that, to convey a sense of urgency for safety education, administrators should develop a written safety plan and a detailed documentation system. Additionally, Lawver and Fraze (1996) recommended that Texas agricultural science teachers receive more pre–service and in–service education in promoting positive safety attitudes. These two efforts may reduce or eliminate preventable injuries in agricultural education programs.

Safety and health education for agricultural education teachers has recently received increased consideration (Thompson and Garton, 1993; Ford and Walson, 1997). In 1989, Johnson and Schumacher found that 11 of the top 18 agricultural mechanics laboratory competencies were safety–based. Swan (1993) recommended designating local and federal funds for improving safety and emergency equipment and instruction available to instructors and students. Safety topics in pre–service and in–service educational programs (Swan, 1993; Hubert, 1996), along with basic first aid and cardiopulmonary resuscitation (CPR) training and certification for agriculture teachers (Bear and Hoerner, 1978; Laird and Kahler, 1995; Ullrich, 1997), have been offered periodically. However, in most cases, it is left to individual school districts, with great variance, to require faculty to obtain or keep certifications.

In *Healthy People 2000*, the DHHS (1990) recommended that education aim at both reducing injury risk and at preparing students to be knowledgeable members of the adult community. This recommendation corresponds with the goals of youth leadership organizations such as FFA. If agricultural education students are promoted as future leaders, then training and modeling of proper agricultural safety measures is desirable, especially in Texas where secondary agricultural education enrollment is almost 90,000, including 58,000 FFA members (Texas Education Agency, 1999). The development of a positive and continuous safety climate within an agricultural education program is directly influenced by the attitudes, beliefs, and skills of the teachers managing that program. In *Healthy People 2010* (DHHS, 2000), as a continuation of the *Healthy People 2000* recommendations, the importance of safety is recognized by DHHS's new objective "to increase the proportion of the nation's primary and secondary schools that have official school policies ensuring the safety of students and staff from environmental hazards, such as chemicals in special classrooms, poor indoor air quality, asbestos, and exposure to pesticides" (objective 8–20).

Agriculture has one of the highest fatality rates of all occupations, according to the U.S. Department of Labor (1998). Since one premise of secondary school agricultural education programs is to prepare students for careers in agriculture, injury prevention

should be a fundamental component of both teacher and student training. Developing a positive and continuous safety climate requires measuring the safety beliefs of the teachers managing the program, appraising the teaching resources used in the program, and understanding of the scope of health and safety education preparation. Preparedness measured in this manner may serve as a proxy measure of the safety practices incorporated into agricultural teaching programs.

## Purpose and Objectives

The purpose of this study was to gather benchmark data for the assessment of the knowledge, attitudes, and perceptions regarding agricultural safety issues and curricula held by Texas agriculture teachers with less than two full years of teaching experience. These entry–year teachers were chosen because they provide a better reflection of teacher education programs' current preparation in the area of safety and health than would be available from veteran teachers. Five objectives were developed to guide this descriptive study:

1. Identify selected demographic characteristics of Texas agricultural science teachers with less than two full years of teaching experience.
2. Determine curricula and types of teaching materials used to address agricultural safety and health by entry–year Texas agricultural science teachers.
3. Ascertain the most preferred and usable types of curricula, as perceived by entry–year Texas agricultural science teachers.
4. Describe the emergency care preparedness of entry–year Texas agricultural science teachers.
5. Determine the beliefs, practices, and attitudes relating to common agricultural safety and health issues of entry–year Texas agricultural science teachers.

## Methods and Procedures

The target population—Texas agriculture teachers with less than two years of teaching experience—was selected from a database of over 1400 Texas agricultural science teachers. The Vocational Agricultural Teachers Association of Texas (VATAT) database served as the frame to identify first–year teachers. This organization, to which more than 90 percent of all Texas agriculture teachers belong, is the main professional organization for Texas agriculture teachers. A total of 98 teachers were identified through the VATAT membership list. Duplicates and foreign elements were removed. Missing elements (individuals who were not on the VATAT list) were identified from university entry–year teacher lists and added to the VATAT teachers, adjusting the frame to 118 identified teachers.

Survey research methodology was used to collect data. The instrument design was a booklet–style questionnaire and consisted of six sections: (I) demographics (seven items), (II) agricultural curricula and teaching materials (six items), (III) classes taught, (IV) personal health and safety training (seven items), (V) personal beliefs (seven items), and (VI) personal practices (ten items). This article will address the responses for sections I, II, and IV–VI. Teacher educators and state agricultural education staff from Texas and Oklahoma served as a panel of experts to review the instrument for face and content validity. Appropriate revisions were completed based on comments. To ensure reliability, the instrument was administered to several agri-

cultural science teachers in southeast Texas. Following review and revision, the instrument was distributed. To ascertain internal consistency, Cronbach's alphas for sections IV (personal health and safety training), V (personal beliefs), and VI (personal practices) were calculated with results being 0.71, 0.62, and 0.57, respectively. The relatively low internal consistency for the personal practices section may be because the items included statements that, while individually important as safety practices, may be unrelated to each other (e.g., "I was ____ when I first operated a tractor equipment alone") or possibly due to small numbers of response items in this section.

Data were collected over an eight–week period during the spring of 1999. The instrument, cover letter, self–addressed postage–paid envelopes, and detailed instructions were mailed during the first week of April 1999. After approximately two weeks, reminder postcards were sent to those failing to respond. Two weeks later, a second survey was mailed. Non–respondents from both mailings were phoned. A final attempt to secure data on the target population was conducted via recruitment and curricula distribution booths at the 1999 Texas FFA convention and VATAT Professional Improvement Conference.

Completed instruments were collected from 74 of the identified 118 agriculture teachers, a 63% response rate. Descriptive statistics, ANOVA, T–tests, and regression procedures were conducted, and all results analyzed at the 0.05 level of significance.

# Findings

Of the 74 teachers who responded, 57 were male (77.03%) and 17 were female (22.97%). This percentage of females was larger than the percentage of all female (8.98%) Texas agricultural education teachers statewide (Texas Education Agency, 1999). The mean age was 27.31 years. For data analyses, teachers were placed in two age groups: a "traditional" group of 20–25 year olds (n = 40), and a "non–traditional" group of 26 years or greater (n = 32). Males were evenly distributed between the two groups (29 and 28, respectively), while almost twice as many females were in the younger group (11 and 6, respectively).

Teachers were well–distributed throughout the VATAT areas, which follow the area structure established by the Texas FFA Association. The ten Texas areas are illustrated in figure 1. The highest frequencies of respondents were in areas III (14, 18.92%), IX (10, 13.51%), and X (8, 10.81%). The remaining seven areas had between 4 (5.41%) and 7 (9.46%) respondents per area (table 1).

**Table 1. Texas entry–year teacher distribution by FFA area (1998–1999).**

| | Area I–V | | | | |
|---|---|---|---|---|---|
| | I | II | III | IV | V |
| | f (%) | f (%) | f (%) | f (%) | f (%) |
| Teachers (N = 74) | 4 (5.41%) | 7 (9.46%) | 14 (18.92%) | 7 (9.46%) | 5 (6.76%) |
| | Areas VI–X | | | | |
| | VI | VII | VIII | IX | X |
| | f (%) | f (%) | f (%) | f (%) | f (%) |
| Teachers (N = 74) | 6 (8.11) | 6 (8.11) | 7 (9.46) | 10 (13.62) | 8 (10.81) |

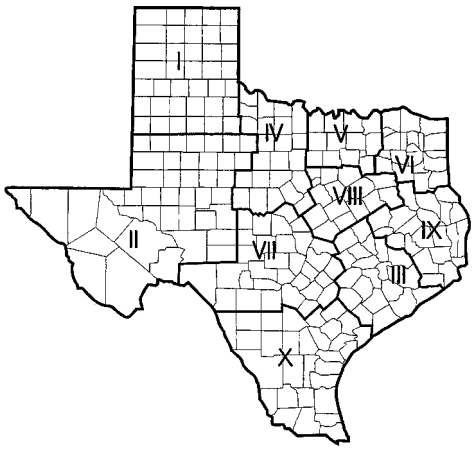


**Figure 1. Vocational Agriculture Teachers Association of Texas (VATAT) areas.**

Rather than creating new categories for school sizes, it was determined to use the existing and well–documented University Interscholastic League (UIL) conference divisions for Texas high schools. To determine distribution by school size, respondents were asked to identify the enrollment size of their school by its UIL division. These divisions are based on current student enrollments, as follows: 5A (1,780 students or greater), 4A (780–1,779 students), 3A (345–779 students), 2A (160–344 students), and 1A (159 students or fewer) (University Interscholastic League, 1999). Data indicated a mean of 146.16 students enrolled in these agricultural education programs (range 16 to 625), of which 91.18 were FFA members (range 5 to 350). The distribution of teachers by school size, based on UIL conference divisions, is presented in table 2.

When asked if they addressed agricultural safety and health topics as separate units of instruction or as subjects within instructional units, 32 teachers (43.24%) indicated that they taught safety as a separate unit. The remaining 42 teachers (56.76%) addressed safety and health as specific subjects within larger units, such as "cattle handling safety" while covering cattle production.

Teachers also identified from a list of teaching technologies those available to them at their respective schools. The most common technology identified by all teachers was televisions with videotape players and overhead projectors. Sixty–six teachers (90.41%) had slide projectors at their disposal, while 63 (85.14%) confirmed that a computer with internet software was available. Additionally, almost two–thirds (62.16%) indicated CD–ROM availability. The least–available equipment was a laserdisc player (17.57%). Only one teacher had a laptop computer for presentations.

As shown in table 3, teachers ranked new teaching resources according to greatest value and use (1 = most useful to 6 = least useful). Using means as indicators of

**Table 2. Entry–year teacher distribution by school size (1998–1999).**

| | UIL Conference Division[a] | | | | |
|---|---|---|---|---|---|
| | 1A | 2A | 3A | 4A | 5A |
| | f (%) | f (%) | f (%) | f (%) | f (%) |
| Teachers (N = 72) | 15 (20.83) | 15 (20.83) | 19 (26.39) | 13 (18.06) | 10 (13.89) |

[a] 1A (<159 students), 2A (160–344 students), 3A (345–779 students), 4A (780–1,779 students), and 5A (>1,780 students)

**Table 3. Entry–year teacher age–group comparison of usefulness of teaching resources.**

| | Age 20–25 | | Age 26+ | | Aggregate | | | |
|---|---|---|---|---|---|---|---|---|
| Response Item[a] | M | SD | M | SD | Rank | Rank | F | P |
| Videotape and study guide | 1.83 | 0.93 | 2.00 | 1.08 | 1.90 | 1.00 | 0.55 | 0.4623 |
| Class demonstration/ Simulation activities | 2.32 | 1.38 | 2.75 | 1.32 | 2.51 | 1.36 | 1.75 | 0.1907 |
| Individual student booklets | 3.75 | 1.48 | 3.38 | 1.58 | 3.58 | 1.53 | 1.07 | 0.3037 |
| Transparencies | 4.25 | 1.10 | 3.59 | 1.39 | 3.96 | 1.27 | 5.00 | 0.0286[b] |
| Interactive media | 4.33 | 1.87 | 3.84 | 2.00 | 4.11 | 1.93 | 1.10 | 0.2969 |
| Slides | 4.20 | 1.49 | 4.19 | 1.62 | 4.19 | 1.53 | 0.00 | 0.9729 |

[a] Possible responses: 1 = most useful to 6 = least useful.
[b] $\alpha = 0.05$.

rankings, the most–useful teaching resources were: videotape and study guide (M = 1.90) and class demonstration/simulation activities (M = 2.51). The least–useful teaching resources were: slides (M = 4.19), interactive media (M = 4.11), transparencies (M = 3.96), and individual student booklets (M = 3.58).

To determine if differences existed between the teacher age groups, the ranking discrepancies for each were calculated. Little statistical differences existed in rankings between the two age groups. However, younger teachers found slides slightly less useful than older teachers (4.20 vs. 4.19), and they found videotapes/study guides and demonstration/simulations more useful. On the other hand, the older category of entry–level teachers found transparencies more useful than did younger teachers by a wider margin than for interactive media.

Emergency care preparedness and safety training of new teachers were also investigated in this study. The results are presented in table 4. Thirty–seven of the 72 respondents (51.39%) received CPR training. Twenty of those teachers (54.05%) were in the age 20–25 group. However, only 16 of the 72 teachers (22.22%) kept their certifications current. Similar to the CPR training responses, 38 of the 72 respondents (52.77%) completed first aid training, with 20 (52.63%) responses coming from the younger group. Only eight (21.05%) of these 38 teachers had current first–aid certification.

Section IV of the instrument elicited information about completion of a general health or safety–related course. Forty–three (58.90%) of the 73 teachers recorded that they had completed a health class prior to teaching. Twenty–six (60.47%) of these 43 were in the age 20–25 group, with the remaining 39.53% were in the age 26 or greater group. Fewer than one–third of all respondents noted that the health or safety course was required for graduation.

**Table 4. Emergency care preparedness and safety training.**

| | Age 20–25 | | | Age 26+ | | | Aggregate | | |
|---|---|---|---|---|---|---|---|---|---|
| Health Education Training | Yes | No | Certified Currently | Yes | No | Certified Currently | Yes | No | Certified Currently |
| CPR trained? (n = 72) | 20 | 19 | 8 | 17 | 16 | 8 | 37 | 35 | 16 |
| First aid trained? (n = 72) | 20 | 19 | 5 | 18 | 15 | 3 | 38 | 34 | 8 |
| Private industry safety training? (n = 70) | 11 | 27 | NA | 16 | 16 | NA | 27 | 43 | NA |
| | Yes | No | Required | Yes | No | Required | Yes | No | Required |
| Health class? (n = 73) | 26 | 13 | 16 | 17 | 17 | 8 | 43 | 30 | 24 |

In section V, teachers were questioned about their personal beliefs and attitudes toward common safety and health issues. On a forced–response, four–point Likert–type scale (1 = highly agree, 2 = agree, 3 = disagree, and 4 = highly disagree), respondents agreed highly that all shops should have a properly working fire extinguisher (M = 1.22) and that a clean, well–organized shop reflects a safe working environment (M = 1.25). Teachers also agreed that wearing proper protective equipment was very important (M = 1.30). Slightly less important was having emergency numbers posted by the phone (M = 1.40), and that seatbelts should be worn and safety devices should be in place when operating tractors and farm machinery (M = 1.48). Respondents agreed that fences around farm ponds, stock tanks, and lagoons were effective safety precautions (M = 1.9). To a lesser degree, teachers agreed (M = 2.06) that mandatory age requirements should be established to operate tractors and/or equipment (table 5).

Response summaries for the personal safety practices of entry–year teachers are reported in table 6. These were considered indicators of teachers' attitudes about a positive safety climate in their programs. Twenty–two (34.92%) teachers answered that they wore a seatbelt when driving a tractor, while a surprising 65.08% did not. Eleven of the respondents found that the question was not applicable. Over three–quarters (82.26%) of teachers who operate tractors indicated that they made sure the PTO shields were in place. The remaining 11 teacher/tractor operators did not follow this basic safety precaution, while eight teachers identified that this question was not applicable. Forty–nine teachers had home shops, with almost 70% designating they had a properly working and accessible fire extinguisher. Overall, almost one–third (32.88%) of the respondents did not have a home shop. Two questions were used to identify basic emergency preparedness in their homes. Just 22 (30.14%) of 73 respondents declared they had emergency phone numbers posted by all phones, while 51 (69.86%) indicated they did not. Only ten (13.51%) of the teachers had directions to their home posted by phones for emergency use.

Table 7 summarizes data on entry–year teachers' age and opinions on age requirements. We were interested in determining the age at which responding teachers first operated a tractor or other agricultural equipment alone. Although the mean age for their own first solo driving was 11.80 years (SD = 3.46), with a range of 5 to 25 years old, these teachers only allowed trained drivers with a mean age of 15 years (SD = 2.13) to drive alone. The range of permissible ages was 10 to 21 years old. The mean age of a child allowed to help with working livestock was 11.06 years old (SD = 3.39), with a range of 3 to 18 years old.

**Table 5. Teachers' personal beliefs and attitudes.**

| Response Item[a] | M | SD | N |
|---|---|---|---|
| All shops should have a properly working fire extinguisher. | 1.22 | 0.71 | 73 |
| A clean and well–organized shop reflects a safe environment. | 1.25 | 0.59 | 73 |
| Proper protective equipment should always be worn when doing agricultural work. | 1.30 | 0.73 | 73 |
| Emergency numbers posted by the phone are a good idea. | 1.40 | 0.79 | 73 |
| Seatbelts should be worn and safety devices in place when operating tractors and farm machinery. | 1.48 | 0.66 | 73 |
| Fences around farm ponds, stock tanks, and lagoons are an effective safety precaution. | 1.90 | 0.80 | 72 |
| Mandatory age requirements should be established to operate tractors and/or equipment. | 2.06 | 0.73 | 73 |

[a] Possible responses: 1 = highly agree, 2 =agree, 3 = disagree, 4 = highly disagree.

**Table 6. Personal safety practices of teachers.**

| Response Item | Yes | No | N | N/A | Total N |
|---|---|---|---|---|---|
| When operating a tractor I wear a seatbelt. | 22 (34.92%) | 41 (65.08%) | 63 | 11 | 74 |
| When operating a tractor I make sure PTO shields are in place. | 51 (82.26%) | 11 (17.74%) | 62 | 8 | 70 |
| My shop at home has properly working and accessible fire extinguishers. | 34 (69.39%) | 15 (30.61%) | 49 | 24 | 73 |
| I have emergency phone numbers posted by all phones. | 22 (30.14%) | 51 (69.86%) | 73 | — | 73 |
| I have directions to our house/property posted by all phones for use in an emergency. | 10 (13.51%) | 64 (86.49%) | 74 | — | 74 |

**Table 7. Teacher safety information and opinions on age.**

| Response Item | M[a] | SD | N |
|---|---|---|---|
| How old were you when you first operated a tractor or equipment alone? | 11.80 | 3.46 | 71 |
| I allow trained drivers age _____ and older to drive tractors and farm equipment alone. | 15.01 | 2.15 | 73 |
| Children must be _____ years old to assist when working with livestock. | 11.02 | 3.30 | 73 |

[a] Mean reported as age in years.

Finally, additional personal safety practices were evaluated. Out of 70 respondents, 22.36% always wear appropriate protective equipment while working, and 68.42% almost always do so. Just over 10% of the teachers rarely (9.21%) or never (1.31%) wore protective equipment. Similarly, these teachers always or almost always followed recommended directions when mixing chemicals. This data is summarized in table 8.

# Discussion

The purpose of this study was to gather benchmark data for the assessment of the knowledge, attitudes, and perceptions regarding agricultural safety issues and curricula held by Texas agriculture teachers with less than two full years of teaching experience. Several areas of interest and concern were determined from a review of the findings. As indicated earlier in Methods and Procedures, the relatively low internal consistency for section VI may be due to the item response statements that, while individually important as safety practices, may be unrelated to each other (multidimensional data), or to small numbers of response items in this section (UCLA Academic Technology Services, 2001).

**Table 8. Additional safety practices of teachers.**

| Response Item[a] | Always | Almost Always | Rarely | Never | M | SD | N |
|---|---|---|---|---|---|---|---|
| While doing agricultural work, I _____ wear the appropriate protective equipment. | 17 (22.36%) | 52 (68.42%) | 7 (9.21%) | 1 (1.31%) | 1.90 | 0.60 | 70 |
| I _____ follow recommended directions when mixing chemicals for application. | 60 (77.92%) | 17 (22.08%) | 0 (0%) | 0 (0%) | 1.22 | 0.42 | 77 |

[a] Possible responses: 1 = Always, 2 = Almost Always, 3 = Rarely, and 4 = Never.

The average age of these new teachers was just over 27 years. Although considerably higher than expected, this may reflect the current practice of recruiting pre–service teachers from the ranks of college graduates in other disciplines, or others returning to school following a few years of work experience in other fields. After being exposed to tighter industry restrictions in agricultural operations, these non–traditional teachers may bring a stronger sense of safety and health responsibility to their teaching positions. The demographic data also indicated that increasing numbers of females have entered this traditionally male–dominated field. Across Texas, females made up almost one quarter of the new teachers in agricultural education classrooms during the 1998–1999 academic year. This was a substantially higher percentage than the percentage of female agriculture teachers in Texas overall (9%).

A surprising piece of data was low FFA membership (62.38%) in programs with entry–year teachers. If extracurricular activities are integral to student learning experiences, then low membership presents a problem for inexperienced teachers. Furthermore, the large proportion of teachers who did not teach safety and health topics within larger units may substantiate a lack of continuous safety education and a weakness in the establishment of an overall safety climate. This study also revealed an element of weakness in the curricula used by the teachers, and in the teacher education programs that prepare these individuals for the challenge of integrating safety and health topics into their curricula.

Given the large percentage of teachers who had access to computers with internet access and CD–ROMs, as well as more traditional audio/video equipment such as slide projectors, televisions, and VCRs, it was interesting that they disliked using interactive media as teaching tools. This provides an opportunity for further investigation into why they preferred other teaching resources. Teachers tended to rank traditional resources, such as videotapes and class demonstration/simulation activities highly, which could indicate inadequate pre–service training in using the newer, interactive media as teaching tools. This finding also appears to contradict research that suggests student achievement may improve when sense–engaging, interactive resources are included in teaching (Roden, 1991). Another factor to consider regarding the lower ranking of interactive media is that easy to use, inexpensive interactive safety media may not be available to these teachers.

In the end, whatever media the teacher uses to deliver the instruction is probably less important than whether or not the teacher adequately models proper safety habits. Whittington (1987), in a review of the available research, concluded that the specific medium used to deliver instruction, whether videotape or instructor–led presentation, had no impact on instructional effectiveness.

Glaring concerns exist related to maintaining emergency care preparedness certifications and health and safety education training. Improvements are needed in this area because only a small percentage of the teachers were certified in CPR and first aid, and less than one–third were exposed to a required a health or safety course.

In general, these teachers have strong personal beliefs about safety. Nearly all affirmed the safety statements indicating that they have an understanding of what is required in a well–defined safety environment. It is also apparent these same teachers do not always follow appropriate personal safety practices; they acknowledged that they occasionally fail to wear appropriate protective equipment when doing agricultural work or when mixing chemicals. This is indicative of a “do as I say, not as I do” attitude and provides increased opportunity for negative incidental, or unplanned, learning (Kerka, 2000). This ethical dilemma cannot be ignored. The teachers seem to understand the safety issues, but they do not follow the safety practices that will protect them and students from injury.

Many of these teachers fail to appropriately model and elicit positive attitudes toward safe practices. Basic safety issues, such as wearing seatbelts when operating a tractor and posting emergency numbers and directions by the phone, were largely ignored. This is significant because tractor–related injuries account for approximately a third of the estimated 270 agriculture–related deaths annually in the United States (Murphy and Yoder, 1998). To a lesser degree, the teachers demonstrated an acceptable level of safety in checking PTO shields when operating tractors and in having fire extinguishers in their home shops.

About 20% of agricultural deaths involve children under the age of 18. Tractors are involved in half of all agricultural childhood fatalities, including those caused by runovers, overturns, and entanglements (Donham et al., 1997). The survey respondents recognize the dangers of allowing children to operate tractors and farm equipment. This is indicated by the differences between the mean age at which the respondents first operated tractors or other equipment and the age at which they would allow children to be involved in the same activity.

## Conclusions and Recommendations

This study found that, even though most schools with entry–year agriculture teachers have access to computer technology, the teachers do not value interactive media as teaching tools. We therefore suggest that teacher education programs emphasize media skills. A compilation of easy–to–use, interactive safety education and injury prevention materials needs to be developed specifically for agriculture teachers and their students. For best results, multimedia materials should be available at low or no cost to agricultural education programs through state or federal funding.

To improve teachers' awareness of the importance of modeling proper safety attitudes and actions, teacher education programs should instill and enforce these attitudes and skills in pre–service teachers. In addition, workshops on safety education, including how to model safety attitudes and actions, should be offered during the annual Professional Development Conference for Texas agriculture teachers. According to Summerfield (1995), teacher preparation should address health content across the entire curriculum, and this preparation is critical to comprehensive and successful school health programs.

Finally, all teachers who are involved with extracurricular activities should receive CPR certification, and CPR certification and first–aid training must be incorporated into all agriculture teacher education programs. To facilitate this, and to meet the state's mandate for such training, CPR certification and first aid training workshops could be offered at the annual Professional Development Conference.

Further research may be necessary to address the unique concerns of females in agricultural education and to gain insight into females' perspectives of safety and health issues. Such investigation could reveal high–priority topics not previously considered. This study should be replicated annually in Texas, as well as in other states, to provide the data necessary for the longitudinal analysis of safety education and preparation of agriculture teachers. Longitudinal analysis will enable us to accurately determine the benefits and outcomes of safety education programs.

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# References


Bear, F., and T. Hoerner. 1978. *Planning, Organizing, and Teaching Agricultural Mechanics*. St. Paul, Minn.: Hobar Publications.

DHHS. 1990. *Healthy People 2000*. National health promotion and disease prevention objectives. Public Health Service Publication No. 91–50212. Washington, D.C.: U.S. Department of Health and Human Services.

_____. 2000. *Healthy People 2010*. Conference edition, in two volumes. Washington, D.C.: U.S. Department of Health and Human Services.

Donham, K., D. Osterberg, M. Myers, and C. Lehtola, eds. 1997, September. *Tractor Risk Abatement and Control: The Policy Conference*. Final report. Iowa City, Iowa: University of Iowa.

Ford, C., and F. Walson. 1997. Laboratory safety practices among agricultural education teachers in North Carolina. Poster presented at the NIOSH Agricultural Health and Safety Conference. 15–17 July. Morgantown, West Virginia.

Hubert, D. 1996. An assessment of agricultural mechanics course requirements in agriculture teacher education programs in the United States. Unpublished master's thesis. Oklahoma State University, Stillwater, Okla.

Johnson, D., and L. Schumacher. 1989. Agricultural mechanics specialists' identification and evaluation of agricultural mechanics laboratory management competencies: A modified Delphi approach. *J. Ag. Education* fall 30(3): 23–28.

Kerka, S. 2000. *Incidental Learning*. Trends and Issues Alert No. 18. ERIC Clearinghouse on Adult, Career, and Vocational Education.

Laird, S., and A. Kahler. 1995. Present and future emphasis of secondary school agricultural mechanics programs in the United States. In *Proceedings of the 22nd Annual National Agricultural Education Research Meeting*, 318–328. Denver, Colorado.

Lawver, D., and S. Fraze. 1996. Factor analysis of variables related to student attitudes and perceptions concerning agricultural mechanics laboratory safety. In *Proceedings of the 22nd Annual National Agricultural Education Research Meeting*, 348–360. Denver, Colorado.

Murphy, D., and A. M. Yoder. 1998. Census of fatal occupational injury in the agriculture, fishing, and forestry industry. *J. Ag. Safety and Health* special issue 1: 56–66.

NSC. 1995. *Accident Facts*. Itasca, Ill: National Safety Council.

Roden, S. 1991. Multimedia: The future of training. *Multimedia Solutions* 5(1): 17–19.

Summerfield, L. 1995. National standards for school health education. *ERIC Digest* ED387483. Accessed 31 May 2000.

Swan, M. 1993. Safety practices in agricultural mechanics laboratories. In *Proceedings of the 20th National Agricultural Education Research Meeting* 21, 372–377. Nashville, Tenn.

Texas Education Agency. 1999. Texas FFA Past and Present: Facts, Mission, and Motto. Available at: www.txaged.org/tfa–fact.html. Accessed 16 November 1999.

Thompson, R., and B. Garton. 1997. The needs of secondary agriculture teachers relative to teaching health and safety. Poster presented at the NIOSH Agricultural Health and Safety Conference. 15–17 July. Morgantown, West Virginia.

UCLA Academic Technology Services. 2001. SPSS Frequently Asked Questions. Available at: www.oac.ucla.edu/stat/spss/faq/alpha.html. Accessed 31 May 2001.

Ullrich, D. 1997. Safety procedures, education, and standards in selected Oklahoma agricultural education programs. In *Proceedings of the 47th Southern and 16th Western Regions Agricultural Education Research Meeting*. 4–5 April 1997. Stillwater, Okla.

University Interscholastic League. 1999. Constitution and Bylaws. Subchapter I, Section 351: Conference based on enrollment. Available at: www.utexas.edu/admin/uil/rules/subi.html. Accessed on 6 December 1999.

Whittington, N. 1987. Is instructional television educationally effective? A research review. *Am. J. Distance Education* 1(1): 47–57.